Condensed Matter Theory Center Seminar

Friday, January 10th
1:30 pm to 3:00 pm, 2205 Physics Building

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"Singular Behavior of Electronic Eigenstates in the Anderson Model of Localization "

The Anderson model of localization, formulated over fifty years ago, has been the foundation on which our understanding of the effects of disorder on electronic systems has been built. The countless number of scientific papers examining this model have mostly focused on the localization-delocalization transition which occurs in dimensions d>2. I will instead talk about recently discovered singular behavior which occurs in this model at large disorder, i.e. within the insulating phase. The singularity, which manifests itself in the form of non-analyticities in measures of wave functions such as the inverse participation ratio, separates a regime of rare resonant states (which evolve into the Lifshitz tail near the edge of the band) from typical Anderson localized states. I will discuss the effects of disorder distribution, dimension and system size on the singular behavior, and the possible repercussions on the metal-insulator phase transition in dimension d=3. I will then show how a large disorder renormalization group (LDRG) scheme can be designed which accurately captures the cross-over from normal Anderson localized states to resonant states, and accurately reproduces the Lifshitz tail near the band edge. Thus, the Anderson model proves to be of utility in studying rare fluctuation phenomena in detail as well as providing a quantitative test for LDRG methods.

(All are welcome to attend)

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